The Municipality of Anchorage
Federal Emergency Management Agency
Cooperating Technical Community
Mapping Activity Statement

Agreement # (insert number)- Hydrologic and Hydraulic Analyses and Floodplain Mapping

In accordance with the CTC Memorandum of Agreement dated June 3, 1999 between the Municipality of Anchorage and the Federal Emergency Management Agency, Agreement #(insert number) is as follows:

1. **Objective and Scope:** The objective of this agreement is to develop detailed hydrologic and hydraulic analyses and floodplain and floodway mapping in The Municipality of Anchorage. Analyses will be of the 10%, 2%, 1%, and 0.2% annual chance floods and floodway representing existing conditions. Hydrologic analyses will be completed for approximately 2 square miles of drainage area and hydraulic analysis and floodplain mapping for approximately 3 linear miles of flooding, including some or all of the following flooding sources: Alyeska Creek, Glacier Creek and California Creek. Delineations will be provided for the 1% and 0.2% annual chance floodplains and floodway and will be used by FEMA to revise the March 5, 1990 Flood Insurance Study (FIS) and Flood Insurance Rate Map (FIRM) for The Municipality of Anchorage.

   GIS-based hydrologic and hydraulic modeling and mapping techniques will be applied to develop digital GIS data sets in support of the automation or semi-automation of modeling and floodplain mapping. All input data and intermediate data processing steps will be developed as required for generating model input parameters and data structures, as well as for processing and visualization of model output data and results. Data collection and processing will be stored in Digital FIRM database structures.

2. **Period of Performance:** This Agreement will begin on August 1, 1999 and end no later than September 30, 2000. This Agreement may be terminated at the option of FEMA or The Municipality of Anchorage in accordance with the provisions of the June 3, 1999 CTC Memorandum of Agreement.

3. **Funding/Cost-Sharing:** will be provided by FEMA for this project. The Municipality of Anchorage will provide additional financial or technical assistance where applicable.

4. **Standards:** The following standards and documents are relevant to this Agreement:
   - Detailed hydrologic and hydraulic analyses and floodplain mapping must follow the standards set forth in FEMA 37, *Guidelines and Specifications for Study Contractors* (January 1995) and Title 44 of the Code of Federal Regulations (CFR), Part 65. FEMA 37 is available at FEMA's website at http://www.fema.gov/mit/tsd/FN_reg.htm.

- Computer models used for hydrologic and/or hydraulic analyses must meet the requirements of 44 CFR 65.6(a)(6) and be on FEMA's *Numerical Models Accepted by FEMA for NFIP Usage* (http://www.fema.gov/mit/tsd/EN_model.htm).
- Topographic mapping used to delineate floodplain and floodway boundaries must be of adequate scale and topographic definition to provide reasonable accuracy. Planimetric features must be compatible with the base map (with respect to horizontal accuracy) to be used by FEMA for Digital FIRM production. Topographic mapping taken from aerial photogrammetry or surveys must comply with the requirements of Appendix 4 of FEMA 37. The selection of the topographic mapping source to be used must be coordinated with the FEMA Project Officer prior to analysis and mapping.
- Any levee or dike systems to be shown on the community's FIRM as providing protection from the 1% annual chance flood must comply with the requirements of 44 CFR 65.10. Chapter 7 of FEMA 37 provides guidelines for evaluating levee systems.
- Flood elevations and floodplain and floodway boundaries must reasonably tie-in to non-revised information in accordance with 44 CFR 65.6(a)(6).
- The floodway must be established in accordance with 44 CFR 65.7, as well as any applicable state requirements.
- Digital mapping must comply with the requirements of Chapter 9 and Appendix 7 of FEMA 37.
- Automated data processing and modeling algorithms for GIS-based modeling and mapping must be documented and submitted to ensure they are consistent with the standards outlined above. Digital data sets (such as elevation, basin, or land use data) must be documented and submitted to FEMA for approval prior to performing the analysis to ensure they meet minimum requirements. If non-commercial (ie, custom developed) software is used for the analysis, then full user documentation, technical algorithm documentation, and the software must be submitted to FEMA for review prior to performing the scope of work.
- Digital Elevation Models (DEMs) and field survey data must meet vertical accuracy requirements contained in Appendix 4 of FEMA 37.

5. **Deliverables:** The Municipality of Anchorage shall deliver all items outlined in Chapter 11 of FEMA 37 in the Technical Support Data Notebook (TSDN) format. These include, but are not limited to, digital floodplain and floodway boundaries; digital profiles of the 10%, 2%, 1%, and 0.2% annual chance water surface elevations; FIS report; floodway data tables; digital copies of all hydrologic and hydraulic modeling (input and output files); and all backup data used in the analyses or mapping. For GIS-based modeling and mapping, The Municipality of Anchorage must deliver all digital input and output data, intermediate data processing products, GIS data layers, and final deliverables in the format of the DFIRM database structure.

6. **Schedule and Milestones:**

Milestone 1 (Scoping Phase): : Tasks to be completed for the first milestone include:

- Final selection of flooding sources and limits to be studied.
- Initial data research to compile information such as effective FIS modeling; historical flood data, gage records, and highwater marks; copies of historical Letters of Map Change (LOMCs); and "as built" construction plans. Guidance for such research is contained in Chapter 3 of FEMA 37.
- Selection of suitable topographic data for floodplain delineation, including comparison of planimetric features (such as roads) to the base map planned for use by FEMA for Digital FIRM production.
- Selection of analysis methodologies, including hydrologic and/or hydraulic computer models to be utilized.
- Determine cross section locations for hydraulic modeling.

Deliverables for the first milestone include:

- Annotated copies of effective FIRMs depicting limits of proposed study.
- Documentation of the proposed source of topographic data, including: scale; contour interval; source/methodology; date of survey/data collection; vertical and horizontal datums; and comparison of planimetric features with the Digital FIRM base map planned for use by FEMA.
- A written summary of the initial data research; proposed analysis methodologies; and a work plan.
- Documentation of digital data sets to be used (such as elevation, basin, and land use data). Full user documentation; technical description of methodologies and algorithms; and a copy of the source codes and custom-developed software applications for GIS-based modeling must also be submitted.
- Copies of topographic maps depicting proposed cross section locations.

Deliverables for Milestone 1 will be submitted to the FEMA Project Officer no later than a date to be determined by FEMA Region Ten and the Municipality.

Milestone 2 (Hydrology Phase): The second milestone includes completing the hydrologic analyses. Deliverables for the second milestone include draft hydrologic analyses in accordance with the TSDN format. Deliverables for Milestone 2 will be submitted to the FEMA Project Officer no later than a date to be determined by FEMA Region Ten and the Municipality.

Milestone 3 (Hydraulics Phase): Tasks to be completed for the third milestone include completing the hydraulic analyses and preparing sample floodplain mapping. Deliverables for the third milestone include the completed hydraulic modeling and sample floodplain mapping in accordance with TSDN format. Deliverables for Milestone 3 will be submitted to the FEMA Project Officer no later than a date to be determined by FEMA Region Ten and the Municipality.

- **Milestone 4 (Final Deliverables):** Tasks to be completed for the fourth milestone include completion of the floodplain mapping; generation of flood profiles; compilation of the FIS report; and completion of the TSDN. The final deliverable will be the completed TSDN and accompanying data. A QA/QC report documenting the results of the independent review of all computational and data processing procedures were independently reviewed must also be submitted. Final deliverables will be submitted to the FEMA Project Officer no later than September 30, 2000.

7. **Certification:** The following certifications apply to this Agreement (as appropriate):
   - Hydrologic and/or hydraulic analyses and data must be certified by a registered professional engineer or licensed land surveyor in accordance with 44 CFR 65.6(f).
   - Topographic information must be certified by a registered professional engineer or licensed land surveyor in accordance with 44 CFR 65.5(c).
   - If fill is to be considered in the mapping to raise land areas above the 1% annual chance flood elevation, certification of the fill must be provided in accordance with 44 CFR 65.5(a)(6) by the community's NFIP permit official, a registered professional engineer, or a licensed land surveyor.
   - Any levee systems to be accredited as discussed in Section 4 of this Task Agreement must be certified in accordance with 44 CFR 65.10(e).

8. **Technical Assistance and Resources:** The Municipality of Anchorage may obtain copies of LOMCs, archived engineering backup data, and data collected as part of the Five-Year Mapping Needs Assessment from FEMA's Mapping Coordination Contractor (MCC) as part of the initial data research. Copies of FEMA's rule-based engineering software packages such as CHECK-2 to evaluate HEC-2 models and FISPLOT, an automated flood profile plotting software package, may also be obtained through the MCC. The MCC may be contacted at 1-877 FEMA MAP. General technical and programmatic information can be downloaded from FEMA's Flood Hazard Mapping website (www.fema.gov/mit/tsd/). Specific technical and programmatic support may be provided through FEMA's MCC; such assistance should be requested through the FEMA Project Officer specified in Section 12 of this agreement.

   (For automated H&H) The Municipality of Anchorage may also consult with the FEMA Project Officer to request support in the areas of: recommended data sources, recommended digital data accuracy standards, assessing vertical data accuracy, data collection methods or sub-contractors, GIS-based engineering and modeling training.

9. **Subcontractors:** Specify any subcontractors to be utilized by the CTC partner to complete the task. Mark "not applicable" if none.

10. **QA/QC Procedures:** The Quality Assurance procedures outlined in Chapter 10 of the *Guidelines and Specifications for Study Contractors* should be followed during the development of the hydrologic and hydraulic analyses and floodplain mapping. Analyses and mapping should be independently reviewed for compliance with the standards defined in Section 4 of this agreement. This independent review will be conducted by The Municipality of Anchorage.

    (For automated H&H) For GIS-based, automated modeling, QA/QC tasks should ensure automated calculations are reasonable and in compliance with standard flood modeling and mapping approaches. The Municipality of Anchorage must document internal QA/QC procedures to FEMA to ensure all calculations and data processing were reviewed.

11. **Reporting:** To be determined by FEMA Region Ten and the Municipality.

12. **Points of Contact:** The FEMA Project Officer is Lawrence Basich and the CTC's Project Manager is Jack Puff, or subsequent personnel of comparable experience who are appointed to fulfill these responsibilities.

Each party has caused this Agreement to be executed by its duly authorized representatives.

George J. Vekalis, Municipal Manager — date 11/22/99

FEMA authorized representative — date 11/9/99

State representative — date

* In states where statutory and/or regulatory requirements require the state's review and/or approval of new flood hazard data, the state will be a signatory to a community's Agreement